

**The authors reply: In reply to the Letter to the Editor
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Lung ultrasound and pulmonary gangrene, step by step

In reply to the Letter to the Editor titled: “Ultrasound for pulmonary gangrene: all that glitters may not be gold.”

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To the Editor:

We thank Nadeem et. al. (1) for their interest in our article entitled “B-mode ultrasound findings in a patient with suspected pulmonary gangrene” (2) and would like to respond to their letter.

As mentioned in our article (2), the patient was initially admitted for an evaluation of his esophagus cancer. The computerized tomography (CT) performed during this assessment, one week before our lung ultrasound evaluation, found no abnormalities in lung parenchyma, especially no tumor, metastasis or encysted pleural effusion. By the way, our ultrasound exam found no mass or pleural effusion. The tracheal aspirations revealed only purulent fluid, without any food particles. Our case was ultimately a patient with no previous pulmonary abnormalities who developed nosocomial pneumonia which condition rapidly became critical under probabilistic antibiotics. These clinical features combined with our ultrasound findings make pulmonary gangrene the most likely hypothesis.

Lung ultrasound is not described as a substitute for CT, which must be so far a necessary tool in such a disease, even for experienced physicians. Lung ultrasound can be considered as a complement to physical examination at bedside. It can be performed rapidly and is easily accessible. Inter-observer reproducibility is usually known as very good, even between experienced and novices, and the learning curve is steep (3,4). The quagmire sign we described in our paper is of apparent intuitive understanding and easy to interpret.

Lung ultrasound could however help the management of pulmonary gangrene by enabling a more rapid diagnosis. In the case we reported previously, an earlier ultrasound evaluation would certainly have led to CT scanning and could have led to an early surgery. Instead of monitoring progress after broaden antibiotic coverage and waiting for microbiological sampling results, as was done. More

generally, the reason of nonresolving pneumonia is usually microbiologic (5). In case of nonresolving pneumonia with persistent infection, the management is usually to repeat full microbiological screen and to broaden antibiotic therapy (5). CT scan will only be used as second-line exploration and mainly if a non-infectious cause is suspected (5). This can cause a delay diagnosis in pulmonary gangrene.

In conclusion, the quagmire sign needs to be studied and we wish to see more reports of ultrasound evaluation in similar cases. To understand the therapeutic implications of this sign, we need to ascertain its diagnosis accuracy using any tools, even autopsy and post-mortem CT. Meanwhile, this new sign is standardized, and contributes in making lung ultrasound a standardized discipline.

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Conflict of interest: we profit of this response for correcting a mistake in the article “*B-Mode Ultrasound Findings in a Patient With Suspected Pulmonary Gangrene*”. The conflicts of interest, fundings, honoraria do not regard Daniel Lichtenstein, but Nicolas Girerd.

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